

**Government of India  
Ministry of Railways**



**ITEM SPECIFIC GUIDELINES FOR  
ZERO TOE LOAD FASTENING (ZTLF) SYSTEM  
Provisional –2019 (First Revision-2020)**

**TRACK DESIGN DIRECTORATE  
RESEARCH DESIGNS AND STANDARDS ORGANISATION  
MANAK NAGAR, LUCKNOW- 226 011**

**PART A. ITEM SPECIFIC GUIDELINES FOR DEVELOPMENT OF FIRMS FOR ZERO TOE LOAD FASTENING (ZTLF) SYSTEM, CONSISTING OF STEEL BASE PLATES, SPECIAL CAST LINERS, RAIL PAD WITH STEEL EMBEDDED RUBBER PAD & ELASTIC RAIL CLIP Mk-III/Mk-V**

1. Steel base plate shall be developed for assembly Drg. no. RDSO/T-8759 and shall be manufactured as per drawing no RDSO/T-8760 and IRS specification for steel base plate (Provisional-2019). Source for steel base plate shall be developed as per extant guidelines for vendor development.
2. The firm manufacturing steel base plate shall have complete infrastructure and in-house facility for manufacturing/fabrication of steel base plate and its testing as laid down in this document.
3. The firm shall be required to produce samples of steel base plate for pre-acceptance tests as per specification, for inspection/testing by RDSO.

**4. RESPONSIBILITIES**

- 4.1
  - a) Steel Base Plates for ZTLF system shall be manufacture as per Indian Railway Standard Specification for Steel Base Plate (Provisional-2019) and Drg. No. RDSO/T-8760 as per purchase order.
  - b) Steel Base Plates approved firm shall supply the complete assembly with Special Cast Liners, Rail Pad with Steel Embedded Rubber Pad & Elastic Rail Clip Mk-III/Mk-V. This is because of the fitment requirements of Special Cast Liners, Rail Pad with Embedded Steel Plate & Elastic Rail Clip Mk-III/Mk-V into steel base plate and dimensional compatibility to each other.
  - c) Necessary testing required on samples of steel base plate for pre- acceptance tests shall be done by RDSO. Necessary arrangement for such tests shall be made by the firm for steel base plate.
- 4.2
  - a) It will be responsibility of the firm of steel base plate to arrange special cast liners for ZTLF system as per Drg. No. RDSO/T-8762, RDSO/T-8763, RDSO/T-8764 & RDSO/T-8765 as per purchase order.
  - b) These special cast liners shall be procured by the firm for steel base plate from RDSO approved sources of SGCI insert as per specification 'IRS Specification for Special Cast Liner Prov. -2019 (First Revision-2020)' and Drg. No. RDSO/T-8762, RDSO/T-8763, RDSO/T-8764 & RDSO/T-8765. This is because of the fitment requirements of special cast liner into steel baseplate.
  - c) Necessary testing required on samples of special cast liners for pre-acceptance tests shall be done by RDSO/ nominated inspection agency. Necessary arrangement for such tests shall be made by the firm for steel baseplate.
  - d) The item specific guidelines for special cast liners shall be as of SGCI insert (Document no. QC-G-7.1-2 of latest version), in addition to above.

- 4.3 a) It will be responsibility of the firm of steel base plate to arrange Rail Pad with Embedded Steel Plate for ZTLF system as per Drg. No. RDSO/T-8761 as per purchase order.
- b) Rail Pad with Embedded Steel Plate shall be procured from RDSO approved sources of 10 mm thick grooved rubber sole plate as per 'IRS Specification of 10 mm thick grooved rubber sole plates for placing beneath the rails (Provisional)-1989'.
- c) Necessary testing on samples of Rail Pad with Embedded Steel Plate for pre-acceptance tests shall be done by RDSO.
- d) The item specific guidelines for Rail Pad with Embedded Steel Plate shall be as of 10 mm grooved rubber sole plates (Document no. TDG 0015 of latest version), and for Stainless Steel Plate the Guidelines for Procuring Stainless Steel Plate for Use with Rail Pad with Steel Embedded Rubber Pad (Provisional-2019) shall be applicable in addition to above.
5. The Elastic Rail Clip Mk-III or Mk-V shall normally be procured by the Zonal Railways from RDSO approved sources as per specification 'IRS T-31' and Drg. No. RDSO/T-3701 or RDSO/T-5919 respectively. However, if it is not feasible for the zonal railways to procure the same due to some unforeseen circumstances, it will be responsibility of the firm of steel base plate to arrange Elastic Rail Clip Mk-III or Mk-V for ZTLF system as per Drg. No. RDSO/T-3701 or RDSO/T-5919 as per the purchase order. This Elastic Rail Clip Mk-III or Mk-V shall be procured from RDSO approved sources as per specification 'IRS T-31' and Drg. No. RDSO/T-3701 or RDSO/T-5919. Necessary testing on samples of Elastic Rail Clip Mk-III or Mk-V for acceptance tests shall be done by RDSO/nominated agency.
6. The overall responsibility for the dimensional tolerances of the various components of the ZTLF System shall be of the Steel base plate manufacturer only.
7. After satisfactory testing of samples and fulfillment of other requirements, the firm shall be considered for approval for ZTLF System as per RDSO Drg. no. RDSO/T-8759.
8. The upgradation of ZTLF vendors from the category of 'Developmental Vendors' to 'Approved vendors' shall be considered in accordance with relevant apex ISO documents of RDSO available on RDSO's website. For upgradation, the minimum quantity of supply by the 'Developmental Vendors' shall be 10,000 sets of ZTLF system (either 52kg or 60kg or both rail sections) to Drg. No. RDSO/T-8759 to RDSO/T-8765.
9. This guideline has been revised in 2020 due to revision in Part-A: Para 4.3 (b), Part-C (A): Sl. No. 12, 13 & 14, Para-8 of Section- I & Para 6.3, 6.4 & 6.5 of Section-II. A new para 8. has been added regarding the minimum supply quantity of ZTLF system for upgradation of ZTLF vendors from the category of 'Developmental Vendors' to 'Approved vendors'.

## **PART B. MANUFACTURING PROCESS OF STEEL BASE PLATE FOR ZERO TOE LOAD FASTENING SYSTEM**

- **Raw Material**

After receiving raw material, i.e. rolled plates, inspection and testing to be done according to 'IRS specification for steel base plates (provisional) 2019'. Results of testing shall be documented in a suitable format and shall be verify with the raw material manufacturer's test reports-

- **Shearing of Rolled Plates**

Accepted rolled plates are to be cut by shearing to length as per drawing. Dimensions to be checked and to be documented in a suitable format.

- **Machining**

After shearing, machining of 1: 20 cant of blank of steel base plate to be done according to the drawing. Dimensions to be checked and to be documented in a suitable format.

- **Forming of Shoulders**

Forming of shoulders to be done by hot pressing and edge machining to be done according to the RDSO drawing. Dimensions to be checked and to be documented in a suitable format.

- **Welding of Shoulders with Steel Base Plate**

Welding of shoulders with Steel Base Plate shall be done according to following Work Instruction.

**a. WORK INSTRUCTION FOR WELDING SHOULDER TO STEEL BASEPLATE**

1. Process used is Metal Inert – Gas Arc Welding (Gas Metal – Arc Welding) with 100% Carbon-di-oxide gas as shielding gas.
2. Welding wire specification is to AWS A5.18, ER 70S6 **equivalent to** DIN – 8559:SG2/BS 2901 Type A18/IS6419.
3. Details of Specification, date of expiry, make of wire shall be checked before opening the reel.
4. The wire must not be rusted. If the reel has been previously used, the storage should be in polythene cover with specification, date of expiry, make and type recorded.
5. The shoulder is to be checked for edge preparation.
6. The surface to be welded shall be cleaned so as to be free from rust, oil, dirt, moisture etc.
7. Welding shall be done by **firm's approved welders** as per IS 7310 (Part 1) & IS 7307 (Part1).
8. The shoulders are to be placed on the base plate by using suitable fixtures before welding.

Inspection procedure for welding of shoulders with steel base plate shall be done as per following Inspection Procedure.

**b. INSPECTION PROCEDURE FOR WELDING OF SHOULDER WITH BASEPLATE**

**1. PRELIMINARY STAGE INSPECTION**

- i) All materials used should be to job specification.
- ii) All materials to be used should be examined for surface, defects, rust, corrosion products, presence of contaminants, laminations etc.
- iii) The welding wire/electrode shall confirm as given in welding procedure manufacturer's label.
- iv) Qualification test certificate of the welder is to be verified.
- v) The welding wire/electrode shall be stored and handled with care and in accordance with manufacturer's recommendation. Wire/electrode that show signs of deterioration, damaged etc. shall not be used.

- vi) The welding wire/electrode shall be stored in original packets or cartons in a dry place adequately protected from the effects of the weather.

## **2. INSPECTION DURING WELDING**

- i) Ensuring that procedures, consumables etc. have been previously approved. Operators/ welder on the job are approved.
- ii) Visual inspection that initial defects have been removed and the Weld has a good finish.
- iii) Welding position, sequence of Welding, edge preparation must be observed and should be as given in Welding procedure.
- iv) The gaps for welding/size of weld must be as per drawing.
- v) No welding will be allowed using contaminated or wet wire/electrodes.

## **3. INSPECTION AFTER WELDING**

- i) Visual: This is done on basis of IS 822:1970. The profile must be correct with welding leg length specified as per drawing. Undercut more than 1 mm is not permitted and can be corrected by welding deposit. Convexity or concavity is permitted to a max. of 1.5mm. The continuity of weld, porosity, spatter, flatness of plate to be observed.
- ii) Liquid Penetrant Flaw detection Test: This is performed as per the specification on 5% of shoulders welded. Process of liquid penetrant test shall be done as per following work instruction.
- iii) Weld leg size: This is measured 100% with gauge. This is done on basis of IS822-1970.

### **c. WORK INSTRUCTION FOR LIQUID DYE PENETRANT FLAW DETECTION TEST**

1. This test shall be done in accordance with IS 3658-1999 or latest version. The chemicals used for this test shall meet the requirements of IS:12889-1989 or latest version.
2. Clean test surface by wire brush, grinding, machining and clean to free from any dirt, grease, welding flux, weld spatter, oil etc.
3. Liquid penetrant is applied to surface to be inspected by spray.
4. Time allowed (10-20 minutes) for penetrant to seep into the opening.
5. After allowing for necessary Penetrant time, the surface film of Penetrant on the part is removed by rinsing.
6. Wet developer is applied to draw penetrant out of opening.
7. Half of the penetration time or 10 minutes after drying of developer may be taken as standard developing time.
8. With visible penetrants, surface defects are indicated by bleeding out of penetrant, which is deep red colour, against white background.
9. Specimen visually examined in proper suitable light with power glass.
10. If any defects post cleaning is required.
11. The nature, size, type and location of defects shall be recorded.
12. No crack/ defect are acceptable.

### **ACCEPTANCE QUALITY TESTS**

Acceptance quality tests to be done according to the specification for steel base plate.

**PART C. MINIMUM FACILITIES OF MACHINERIES & TESTING EQUIPMENTS REQUIRED FOR  
MANUFACTURE OF STEEL BASE PLATES FOR ZERO TOE LOAD FASTENING SYSTEM**

**A. MACHINERIES**

| <b>SNo.</b> | <b>Description</b>   | <b>Minimum Capacity</b>                                   | <b>Min. Quantity</b> |
|-------------|--|---|----------------------|
| 1.          | Covered Area   | Sufficient area   | Sufficient area      |
| 2.          | Shearing Machine (for shearing 200mmx22mm plate)   | 250MT   | One No.              |
| 3.          | Shaping Machine (for 1:20 Cant machining & cleaning of weld from shoulder with base plate joint) | 600mmstroke   | Two Nos.             |
| 4.          | Hydraulic plate straightening machine  | 100MT   | One No.              |
| 5.          | Radial drilling machine  | 32mm dia  | One No.              |
| 6.          | Shearing machine (for shearing shoulder plate)   | 100MT   | One No.              |
| 7.          | Furnace (to heat shoulder plate before Forming)  | ---   | One No.              |
| 8.          | Hydraulic press (for forming shoulder)   | 100MT   | One No.              |
| 9.          | Transformer (for tack welding of shoulder with baseplate)  | 400AMP  | One No               |
| 10.         | MIG welding machine/CO2(for welding of shoulder with baseplate)                                  | 400AMP  | One No               |
| 11.         | Angle grinding machine   | 4"  | One No.              |
| 12.         | Profile gas cutter   | ---   | One No               |
| 13.         | Lathe machine  | 5'  | One No               |
| 14.         | Jig & fixture for drilling and welding   | ---   | One No               |
| 15.         | Assembly and inspection bay  | a separate area to be dedicated with proper leveled floor | ---                  |

**B. Physical Testing Lab**

|     |  |                                       |             |
|-----|--|---------------------------------------|-------------|
| 1.  | U.T. machine   | 40T                                   | One No      |
| 2.  | Brinell Hardness Testing Machine   | 3000kg                                | One No      |
| 3.  | Charpy Impact Machine  |                                       | One No      |
| 4.  | Surface Plate  | 36"x36"                               | One No      |
| 5.  | Vernier calipers   | 150mm & 600mm                         | One No each |
| 6.  | Vernier height gauge   | 300mm                                 | One No      |
| 7.  | Bevel protector  | -                                     | One No      |
| 8.  | Filler gauge   | 0.05-1.00mm                           | One No      |
| 9.  | Weld gauge   | 0-35mm                                | One No      |
|     |  | 0-10mm                                | One No      |
|     |  | 0-60 <sup>0</sup> & 0-45 <sup>0</sup> | One No each |
| 10. | Liquid penetrant testing kit   | -                                     | One No      |
| 11. | Fixture for Weld Strength Test for Steel Base Plate as per sketch attached with this document as ANNEXURE to be used with UTM. |                                       | One No      |

**C. Chemical Lab**

|  |         |         |
|--|---------|---------|
| 1. Carbon content determination apparatus  | One set | One Set |
| Chemical Lab equipped with Physical balance,<br>hot plate, Muffle furnace etc. and all required<br>chemicals & Apparatus | -       |         |
| Or   |         |         |
| Vacuum Spectrometer  |         |         |
| 2. Metallurgical Microscope  | 100x    | One No  |
| 3. Grinding & polishing arrangement  | -       | One set |

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**ASSESSMENT PROFORMA FOR APPROVAL FOR MANUFACTURE OF STEEL BASE PLATES FOR ZERO TOE  
LOAD FASTENING SYSTEM**

**(TO BE PREPARED IN DUPLICATE)**

**SECTION I: GENERAL INFORMATION**

1. Name of the firm
  
2. Postal address of
  - 2.1 Head Office
  - 2.2 Works
  
3. Telephone No. (with STD Code)
  - 3.1 Head Office
  - 3.2 Works
  
4. Telegraphic address, Telex & Fax of
  - 4.1 Head Office
  - 4.2 Works
  
5. Description of works
  - 5.1 Total land area (in Sq. meters)
  - 5.2 Total covered area (in Sq. meters)
  - 5.3 Different sub-units
  - 5.4 A fully dimensioned plan of the works  
showing covered area and different shops  
shall be enclosed
  - 5.5 Special features, if any
  
6. Number of personnel employed(category-wise)
  - 6.1 Managerial
  - 6.2 Supervisory  
(Enclose list of Managers/Technical Supervisors)
  - 6.3 Skilled/Artisans
  - 6.4 Unskilled
  
7. Hours of working
  
8. State whether the firm is already in the approved  
list of vendors with RDSO for supply of any other  
item. If so, please give details of last approval.
  - 8.1 Letter no. & date and issued by
  - 8.2 Date of expiry of validity of approval



9. If this application is an application for renewal of approval, have inclusion of any additional items in the approved list also been requested?

## **SECTION II: TECHNICAL INFORMATION**

1. Production capacity
  - i) Per month
  - ii) Per Year
  
2. Type of Stores/Items, which the firm is capable of manufacturing.
3. Details of Stores/Items/Parts/Components for which fresh approval/ renewal of approval is sought (please indicate complete description and drawing nos.)
  
4. Total Power availability (in KVA/KW)
  - a) From State Electricity Board or other regular source  
(Enclose a copy of current electricity bill)
  - b) From own stand-by power generating sets (Also give make, capacity & other details of each generating set)

### **5. Manufacturing facilities**

#### **5.1 Power Press**

- a) Their Nos.
- b) Capacity
- c) Make

#### **5.2 Grinder**

- a) Their nos

#### **5.3 Heating furnace**

- a) Their Nos.
- b) Make

#### **5.3 Welding arrangement**

- a) Transformer with capacity & nos
- b) MIG welding machine & nos

### **6. Tool Room facility**

- 6.1 Tool Room cum die making / repair shop facility
- 6.2 Source of Raw Material
- 6.3 Arrangement for storing the raw material
- 6.4 Arrangement for storing the finished product

## **7. Infrastructure for testing**

7.1 Through UTM machine capacity & date of calibration

7.2 Izod/Charpy Impact Test

7.3 Bend test

7.4 Liquid-penetrant test

7.5 Hardness test apparatus on BHN scale with standard test block

7.6 Lab. Cum inspection room

i) Microscope x 100 magnification with eyepieces x 100magnification

ii) Carbon & Sulphur apparatus with suitable chemicals for analyzing C, Si, Mn, S & P elements

iii) Muffle Furnace

iv) Analytical Balance

v) Other apparatus for the chemical / metallurgical test

lab. or

Vacuum Spectrometer

7.7 Other facilities

i) Surface plate

ii) Height gauge

iii) Bevel protractor to read up to 5 minute angle(Min.)

iv) Vernier caliper to read up to 0.02 mm (Min.)/dial vernier

v) IS/ ASTM Codes

## **SECTION-III**

### **DECLARATION**

- 1) We do hereby declare that the above particulars are correct and no discrepancy shall be found during actual investigation before and during execution of order on our firm.
- 2) Any change in the plant and machinery and change of place of office and of Works site shall be brought to the notice of RDSO for clearance and approval.
- 3) We also declare that our concern has not been blacklisted by Railway/Railway Board/RDSO for business with the Railways.
- 4) We hereby undertake that all our equipments for manufacture and testing as listed above shall be maintained in good working order at all time.

Place:

Signature of Manufacturer

Date:

Office Seal

